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ABSTRACT

An evaluation of an academic support program at the University of Missouri-Columbia is discussed. The Learning Center's support program provides assistance in writing, math, study skills, reading, science, and other subjects, as well as individual and small group tutoring. The Learning Center keeps computer records of each student's participation in the center's activities. Using files set up by the Office of Institutional Research, a study demonstrated the retention rates of users as compared to all undergraduates. A comparison of the fall to fall enrollment rates of program users to the overall campus figures verifies an enhanced retention rate for program users. Other studies have compared the academic achievement of participants and nonparticipants in help sessions. Analysis of variance was used to compare the test scores of participants in help sessions in two courses, economics and college algebra. For three consecutive semesters, a comparison was made of the scores on two exams taken during the term, the final exam, and total exam points. Generally, students who sought academic assistance were of lower ability but either performed on par with higher ability students or better than predicted. (SW)

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# Analysis of an Academic Assistance Program's Success in Retaining Students

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Paper presented at the Southern Association for Institutional Research Annual Meeting, Little Rock, Arkansas, October, 1984

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## Abstract

This paper explains the evaluation procedure of an academic support program at a land-grant university in the midwest. A comparison of the fall to fall enrollment rates of program users to the overall campus figures serves to verify an enhanced retention rate for program users.

Analysis of variance was used to compare the test scores of participants in help sessions in two courses. Generally, students who seek academic assistance are of lower ability but perform better as a result of the assistance they receive.

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This paper was presented at the 1984 Annual Conference of the Southern Association for Institutional Research held in Little Rock, Arkansas, October 24-26, 1984. It was reviewed by the SAIR Publications Committee and was judged to be of interest and pertinent to others concerned with the research in higher education. This paper has therefore been selected to be included in the ERIC collection of Conference Papers.

Richard D. Howard
President, SAIR

## ABSTRACT

### Analysis of an Academic Assistance Program's Success in Retaining Students

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University of Missouri-Columbia

Many campuses offer academic support programs to supplement classroom instruction. Students often come to colleges and universities with deficiencies in their academic backgrounds. Students also learn at different rates and in response to a variety of teaching techniques.

This paper outlines two studies that have been conducted at the University of Missouri-Columbia's Learning Center. Offering academic assistance in writing, math, study skills, reading, science, and other subjects, the Learning Center provides individual and small group tutoring. The studies reported are a portion of the on-going evaluation efforts of the unit.

The essential element in the studies is an adequate database. The Learning Center keeps computer records of each student's participation in the center's activities. Using files set up by the Office of Institutional Research, a study was conducted which demonstrated the retention rate of users as compared to all undergraduates. Other studies have compared the academic achievement of the participants and non-participants in help sessions using analysis of variance to test the statistical significance of the differences. Generally, students who seek academic assistance are of lower ability and perform on par with higher ability students or they perform better than predicted.

## Introduction

As the number of students entering higher education stabilizes or begins to dwindle, it becomes more and more important to insure that they stay on campus beyond one or two semesters. Many campuses offer academic support programs to supplement classroom instruction in an effort to improve the retention rate of their students.

Although the reasons for the existence of academic support programs vary, they exist largely due to the lack of preparation students have had in their secondary schooling. The Learning Center at the University of Missouri-Columbia began in 1976 as a result of a federal grant to provide special services for disadvantaged students under Title IV of the the Higher Education Act. Since that time, it has developed into a comprehensive support unit which provides assistance to students in writing, math, science, study skills, reading and general education requirements. Although individual tutoring is limited to students eligible under the federal grant or to minority students eligible under a university grant, assistance is offered to all undergraduate students through group help sessions in over twenty courses. Help is provided in courses which have high enrollments and high ratios of students who fail.

More than 6,000 students use the Learning Center each year. In 1983-1984, over half of the freshmen at UMC received academic assistance from the program. Seventy-five percent of the students who seek help from this service are either freshmen or sophomores. Complete information regarding Learning Center users is in the appendix.

This paper is a description of two of the ways the staff of the Learning Center has approached evaluating the success of its efforts. First, a study was conducted which looked at the retention rates of users of the Learning Center as compared the all undergraduate students. Second, analysis of variance was used to compare the test scores in two courses of students who participated in group and individual tutoring with those who did not seek assistance.

## Literature Review

Although students who are academically underprepared are among the most drop-out prone in higher education (Beal and Noel, 1980; Astin, 1975), a well-designed learning assistance program can influence retention (Lauridsen, 1980; Maxwell, 1980). Empirical evidence of the effectiveness of such programs hardly exists. One study (Blanc, DeBuhr, and Martin, 1983) demonstrated that students who used supplemental instruction for

specific courses performed better and showed higher retention rates than those who did not. Beal and Noel (1980) report on several action projects where special programs for students have reduced attrition. In a study by Armstrong and Hall (1976), disadvantaged students had lower completion rates but those who persisted performed as well as the regular-entry students.

Pantages and Creedon (1978) encouraged colleges and universities to proceed with such intervention programs to minimize the attrition problems of students. In Tinto's model (1975) of the attrition process, the frequency and quality interaction of faculty and students in formal academic and informal social settings was important in influencing the students' college completion goals and commitments to the institutions. Help sessions such as those described in this paper offered the informal setting in which interaction between and among students and tutors could take place.

Offering special help sessions speaks to Cope and Hannah's (1975) description of the lack of fit between the institution and its students due to the poor teaching quality of inexperienced teaching assistants in some lower division courses.

## Methodology

### Data Sources

Since 1977, a record of each contact each student has had with the Learning Center has been recorded. Information has been kept on the student identification number, date of contact, type of contact, subject area or course where assisted, tutor identification, and amount of time of the contact. This information has been stored on computer tapes. Demographic information on all undergraduate students has been obtained on a computer tape at the beginning of each semester. As students use the Learning Center, the demographic information has been merged with the contact information to form a database from which to conduct studies and make reports to the campus and the the federal government.

### Retention Study

The Office of Institutional Research at the University of Missouri-Columbia created a Statistical Analysis System (SAS) dataset for the Learning Center which contained the information necessary to conduct a retention study. The purpose of this tape was to provide researchers at the Learning Center only information they needed and to save funds by not having to run against the entire student database.

A report was prepared which recorded the fall to fall retention rates of Learning Center users, their academic

standing, their graduation rates, and grade point averages. This report of Learning Center users was compared to similar reports prepared by campus officials for various agencies.

Analysis of Variance-Economics and Mathematics

Analysis of variance was used to test the significance of the differences in test scores of students who attended help sessions in two courses that had high enrollments and well-attended help sessions. Supplemental instruction was offered in Economics 51, General Economics, twice a week during hourly sessions held in the late afternoon. Participation was voluntary. The sessions were devoted to reviewing and reinforcing the major concepts presented during the class lecture. The tutor went over important definitions, graphs and theories. Many examples were given of the complex material which the students had been presented in class. Students were given an opportunity to ask questions on points that remained unclear to them.

Assistance to students enrolled in Math 10, College Algebra, was in a lab setting. Sessions were scheduled for an hour and a half in the late afternoon and evening four days a week. At the beginning of each session, students were assigned a tutor with whom to work individually or in a small group. The material covered each day followed what had been presented in class. Students were given exercises to work, an explanation of the concepts, and help with improving their problem solving skills. Participation was voluntary.

Analysis of variance (ANOVA) was used to test the significance of participation in explaining test scores. The difference in the mean test score between the participants and non-participants was either statistically significant or not depending on the results of the analysis. The General Linear Models procedure in Statistical Analysis System was used since the data was unbalanced. The significance probability is noted on the tables.

One frequent difficulty when comparing grades of groups of students occurs when the measure of success is confounded with one or more extraneous variables. Certainly, ability often is a confounding variable. The appropriate statistical approach to this problem is to include this variable in the model used to explain the measures of success, ie. test scores. In ANOVA, statistical significance is evaluated based on the unique variation accounted for by a factor.

Ability was measured by scores on the School and College Ability Test (SCAT) for the economics students. Since the university allows several different tests to be used for admission, the score the most students have in common is on a version of the SCAT which is administered during summer orientation. An algebra diagnostic pretest given at the beginning of the course to assess whether a student enrolled in the course is adequately prepared for that course was used to indicate the abilities of

the math students. As might be anticipated, some students did not have test scores, and the data for these students were removed from the analysis.

In order to correct for the influence of ability on the test scores, ability was considered a factor along with participation through the use of a two-factor analysis of variance. This statistical technique allowed for testing the difference because of ability, participation and the interaction of ability and participation.

The test scores were standardized and this standard score was used as the unit of analysis. The next step in the procedure was to compute for each group the difference in test scores between when the student initially attended the session and and the next test. Finally, the difference between participants and non-participants were compared against the null hypothesis of zero, that is, no significant difference exists in test scores between participants and non-participants. Only the results of the preliminary procedures are presented here.

## Findings

### Overall Retention

The results of the study of the retention rates of Learning Center users as compared to that of all undergraduates is displayed in Table 1.

Table 1

Percentage of Learning Center Users and all Full-Time Undergraduates Enrolled at UMC for Fall who Returned or Graduated by the Next Fall for 1980-81, 1981-82, and 1981-83 by Class

| | 1980-81 | | 1981-82 | | 1982-83 | |
|---|---|---|---|---|---|---|
| | Users | All | Users | All | Users | All |
| Freshmen | 77% | 76% | 77% | 75% | 80% | 77% |
| Sophomores | 82% | 80% | 82% | 81% | 81% | 81% |
| Juniors | 82% | 86% | 81% | 86% | 82% | 87% |
| Seniors | 84% | 89% | 73% | 90% | 82% | 92% |

Since another study revealed that Learning Center users had lower scores on all entrance and placement tests on the average than do non-users, it was determined that to have users be retained at or above the all-campus rates was an indication of success. Fewer upperclass students use the services of the

Learning Center than do underclass students. If juniors and seniors do seek academic assistance, they generally are in serious academic trouble (see the appendix). For the group of students for whom the program is focused, freshmen and sophomores, the Learning Center users are retained at or above the rate for all undergraduates.

General Economics

For three consecutive semesters: Fall 1982, Winter 1983, and Fall 1983, a comparison was made of the test scores on two exams taken during the term, of the final exam, and of total exam points for students who attended weekly help sessions and those who did not. Students who attended only the test review sessions held in addition to the weekly sessions were not included as participants.

Scores were analyzed for 585, 935, and 512 students for each semester, respectively. The results of comparing the mean test scores appear in Table 2.

Table 2

Mean Performance for Students Enrolled in Economics 51 Fall Semester 1982, Winter Semester 1983, Fall Semester 1983

| Group | N | Test 1 | Test 2 | Final | Total |
|---|---|---|---|---|---|
| Fall 1982 | | | | | |
| Participants | 192 | 21.7 | 19.8 | 44.4 | 85.9 |
| Non-Participants | 393 | 22.3 | 20.0 | 43.1 | 85.4 |
| p value | | .13 | .73 | .16 | .77 |
| Winter 1983 | | | | | |
| Participants | 347 | 25.3 | 25.0 | 42.7 | 93.0 |
| Non-Participants | 588 | 25.9 | 25.4 | 42.8 | 94.1 |
| p value | | .04 | .24 | .97 | .38 |
| Fall 1983 | | | | | |
| Participants | 165 | 23.6 | 23.0 | 42.7 | 89.3 |
| Non-Participants | 347 | 24.7 | 23.0 | 43.1 | 90.8 |
| p value | | .04 | .93 | .69 | .40 |

At first glance, these results do not appear noteworthy since there was not a statistically significant difference between the students who received help and those who did not. When ability is taken into consideration, the results do have meaning.

Table 3 contains the results of comparing the total SCAT score of the participants and non-participants for whom scores were available. Students who sought help for the course consistently had lower SCAT scores than those who did not have supplemental instruction. The interaction between ability and participation was not significant.

Table 3

Mean SCAT Total Scores for Students Enrolled in Economics 51, Fall Semester 1982, Winter Semester 1983, Fall Semester 1983

| Group | | N | SCAT Total |
|---|---|---|---|
| Fall 1982 | Participants | 146 | 49.7 |
| | Non-Participants | 279 | 53.4 |
| | p value | | .001 |
| Winter 1983 | Participants | 315 | 47.7 |
| | Non-participants | 499 | 52.0 |
| | p value | | .0002 |
| Fall 1983 | Participants | 101 | 45.2 |
| | Non-participants | 246 | 50.6 |
| | p value | | .006 |

When dividing attendance into those who attended less than three sessions, three to six sessions, or more than six sessions, there remains a statistically significant difference between most of the total SCAT score means of the four groups (see Table 4).

Table 4

Mean SCAT Total Scores for Students Enrolled in Economics 51, Fall Semester 1982, Winter Semester 1983, and Fall Semester 1983 by Attendance Rate

| Sessions Attended | N | SCAT Total Score |
|---|---|---|
| Fall 1982 | | |
| None | 279 | 53.4ab |
| Less than three | 56 | 50.5 |
| Three to six | 50 | 49.2b |
| More than six | 40 | 49.2a |
| Winter 1983 | | |
| None | 506 | 52.0a |
| Less than three | 110 | 49.5 |
| Three to six | 69 | 48.1 |
| More than six | 129 | 45.8a |
| Fall 1983 | | |
| None | 246 | 50.6ab |
| Less than three | 45 | 48.7 |
| Three to six | 28 | 43.6b |
| More than six | 28 | 41.3a |

means with a common letter are statistically different

These data indicate that students of lower ability attend the help sessions.

Table 5 contains the breakdown of test scores between the groups according to attendance.

Table 5

Mean Test Scores for Students Enrolled in Economics 51, Fall Semester 1982, Winter Semester 1983, and Fall Semester 1983 by Attendance Rate

| Sessions Attended | N | Test 1 | Test 2 | Final | Total |
|---|---|---|---|---|---|
| Fall 1982 | | | | | |
| None | 393 | 22.4a | 20.0 | 43.0a | 85.4 |
| Less than three | 73 | 21.8 | 19.2 | 43.1 | 84.1 |
| Three to six | 66 | 20.9a | 19.6 | 44.1 | 84.6 |
| More than six | 53 | 22.5 | 21.0 | 46.5a | 90.0 |
| Winter 1983 | | | | | |
| None | 595 | 25.9a | 25.4a | 42.8 | 94.1 |
| Less than three | 125 | 25.2 | 24.3ab | 41.0a | 90.5a |
| Three to six | 78 | 24.4ab | 24.6 | 41.8 | 90.8b |
| More than six | 137 | 25.7b | 26.0b | 44.6a | 96.3ab |
| Fall 1983 | | | | | |
| None | 347 | 24.7ac | 23.0 | 43.1 | 90.8 |
| Less than three | 70 | 24.7b | 23.2 | 43.2 | 91.1 |
| Three to six | 41 | 22.6ab | 21.9 | 41.4 | 85.9 |
| More than six | 54 | 23.1c | 23.4 | 43.0 | 89.5 |

column means with a common letter are statistically different

A comparison of test scores for these groups reveals that these lower ability students can perform at a comparable rate with higher ability students particularly if they attend more than six help sessions .

College Algebra

For three consecutive semesters: Winter 1983, Fall 1983, and Winter 1984, a comparison was made of the test scores on two departmental exams taken during the term, the final exam and total exam points for students who attended the math lab and those who did not. Students who attended only test review sessions held in addition to the weekly tutorials were not included as participants.

Scores were analyzed for 624, 1182, and 602 students for each respective semester. The results of comparing the mean test scores appear in Table 6.

Table 6

Mean Performance for Students Enrolled in Math 10 Winter Semester 1983, Fall Semester 1983, and Winter Semester 1984

| Group | N | Test 1 | Test 2 | Final | Total |
|---|---|---|---|---|---|
| Winter 1983 | | | | | |
| Participants | 113 | 14.9 | 14.2 | 25.7 | 54.8 |
| Non-Participants | 512 | 16.8 | 16.3 | 28.9 | 62.0 |
| p value | | .0001 | .0001 | .0005 | .0001 |
| Fall 1983 | | | | | |
| Participants | 259 | 19.0 | 18.2 | 32.9 | 70.1 |
| Non-Participants | 923 | 20.2 | 19.0 | 34.8 | 74.0 |
| p value | | .0001 | .0023 | .0006 | .0001 |
| Winter 1984 | | | | | |
| Participants | 124 | 14.9 | 14.1 | 27.4 | 56.4 |
| Non-Participants | 478 | 16.5 | 15.8 | 29.3 | 61.6 |
| p value | | .0001 | .0002 | .0243 | .0005 |

Contrary to what was true for the students in economics, there was a statistically significant difference between the test scores of those who participated in the math lab and those who did not. In all cases, the non-participants made higher scores. But when the algebra pretest scores of the two groups are examined in Table 7, it is evident again that the students who come for help are significantly behind those who do not seek assistance in terms of their predicted performance.

Table 7

Mean Pretest Scores for Students Enrolled in Math 10 Winter Semester 1983, Fall Semester 1983 and Winter Semester 1984

| Group | | N | Pretest Score |
|---|---|---|---|
| Winter 1983 | Participants | 91 | 22.1 |
| | Non-participants | 377 | 28.3 |
| | p value | | .0001 |
| Fall 1983 | Participants | 222 | 25.5 |
| | Non-Participants | 821 | 31.2 |
| | p value | | .0001 |
| Winter 1984 | Participants | 86 | 24.5 |
| | Non-Participants | 352 | 29.2 |
| | p value | | .0001 |

As with the economics students, there was no interaction between ability and participation in the math lab.

Grouping the students into those who attended various numbers of labs and comparing them with non-attenders provides a more detailed look at performance patterns. Table 8 displays the pretest scores.

Table 8

Mean Pretest Scores for Students Enrolled in Math 10 Winter Semester 1983, Fall Semester 1983, and Winter Semester 1984 by Attendance Rate

| Session Attended | Pretest score N | Score |
|---|---|---|
| Winter 1983 | | |
| None | 378 | 28.2abc |
| Less than three | 54 | 22.2a |
| Three to six | 21 | 24.5bd |
| More than six | 15 | 18.7cd |
| Fall 1983 | | |
| None | 822 | 31.2abc |
| Less than three | 115 | 26.7ad |
| Three to six | 63 | 23.7bd |
| More than six | 43 | 24.5c |
| Winter 1984 | | |
| None | 352 | 29.2abc |
| Less than three | 48 | 25.8ad |
| Three to six | 21 | 23.9b |
| More than six | 17 | 21.9cd |

means with a common letter are statistically different

The students who attend more of the lab sessions are generally of lower ability than students who attend fewer or no sessions. Students who attended six or more lab sessions should have made scores leading to an F or D in the course.

Table 9 displays the test scores for students who attended the sessions at different rates and those who did not attend the lab.

Table 9

Mean Performance for Students Enrolled in Math 10 Winter Semester 1983, Fall Semester 1983, and Winter Semester 1984 by Attendance Rate

| Session Attended | N | Test 1 | Test 2 | Final | Total |
|---|---|---|---|---|---|
| Winter 1983 | | | | | |
| None | 513 | 16.8ab | 16.3ab | 28.9a | 62.0a |
| Less than three | 65 | 14.6a | 13.9a | 24.4a | 52.9a |
| Three to six | 29 | 16.1 | 15.1 | 27.0 | 58.2 |
| More than six | 18 | 13.9b | 13.6b | 28.2 | 55.7 |
| Fall 1983 | | | | | |
| None | 924 | 20.2ab | 19.0ab | 34.8ab | 74.0ab |
| Less than three | 139 | 19.1a | 18.5 | 33.1a | 70.7a |
| Three to six | 70 | 18.6b | 17.7a | 32.3b | 68.6b |
| More than six | 49 | 19.3 | 17.7b | 33.2 | 70.2 |
| Winter 1984 | | | | | |
| None | 479 | 16.5ab | 15.8ab | 29.3ab | 61.6ab |
| Less than three | 69 | 14.4ac | 13.7a | 26.8a | 54.9ac |
| Three to six | 28 | 14.8b | 13.2bcd | 26.1bc | 54.1bd |
| More than six | 26 | 16.2c | 16.1cd | 30.4c | 62.7cd |

column means with a common letter are statistically different

Students who received assistance in algebra through tutoring in the math lab more than six times performed much better than their pretest score predicted that they would. In the Winter of 1984, they performed even better than the non-participants.

## Discussion

Initially, it appears that those who received academic assistance did not do very well. When their ability is taken into account, the performance of the students is improved by the help they receive. In some cases, they performed on par or better than the higher ability students who did not receive supplemental instruction.

The studies presented here are considered a "micro" approach to one campus's retention evaluation procedures. When individual units cooperate with institutional research offices, both can gain in the information obtained. Often, campuswide studies do not isolate areas that are contributing to improving the retention of students on a campus. As more colleges and universities move to action programs rather than "drop-out" studies, efforts need to be made to evaluate the programs.

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## Appendix

# LEARNING CENTER LONGITUDINAL PRODUCTION RECORDS

| YEARS | | | 1977-78‡ | 1978-79 | 1979-80 | 1980-81 | 1981-82 | 1982-83‡ | 1983-84 |
|---|---|---|---|---|---|---|---|---|---|
| **STUDENTS SERVED** | | | | | | | | | |
| TOTAL | | All | 1728 | 3805 | 5552 | 6268 | 6553 | 5815 | 6380 |
| | | E's | 596 | 884 | 2039 | 2568 | 2859 | 1059 | 998 |
| BY AREA | | ALL | 775 | 2320 | 2589 | 3399 | 3499 | 2538 | 2471 |
| | MATH | E's | 280 | 419 | 934 | 1498 | 1651 | 487 | 368 |
| | WRITING/READING | ALL | 331 | 1200 | 2048 | 1620 | 1414 | 1773 | 1779 |
| | STUDY SKILLS | E's | 161 | 332 | 331 | 870 | 814 | 416 | 303 |
| | OTHER SUBJECTS | ALL | 366 | 1123 | 2212 | 3100 | 3564 | 3118 | 4222 |
| | | E's | 113 | 355 | 841 | 1299 | 1521 | 599 | 695 |
| BY CLASS | | ALL | 922 | 1612 | 2724 | 2724 | 3308 | 2651 | 3228 |
| | FRESHMAN | E's | 262 | 455 | 1230 | 1516 | 1906 | 469 | 446 |
| | | ALL | 414 | 751 | 1169 | 1169 | 1661 | 1457 | 1454 |
| | SOPHOMORES | E's | 133 | 268 | 454 | 542 | 676 | 331 | 330 |
| | | ALL | 201 | 325 | 400 | 512 | 591 | 566 | 541 |
| | JUNIORS | E's | 66 | 91 | 49 | 143 | 170 | 149 | 151 |
| | | ALL | 70 | 153 | 268 | 268 | 300 | 381 | 323 |
| | SENIORS | E's | 33 | 43 | 84 | 43 | 70 | 110 | 71 |
| BY ETHNIC ORIGIN | WHITE | ALL | 825 | 2627 | 4203 | 4855 | 5235 | 4386 | 4666 |
| | | E'S | 528 | 786 | 1842 | 2229 | 2471 | 840 | 795 |
| | BLACK | ALL | 77 | 241 | 372 | 335 | 316 | 341 | 305 |
| | | E'S | 56 | 86 | 168 | 170 | 207 | 158 | 144 |
| | OTHER | ALL | 23 | 63 | 109 | 141 | 125 | 71 | 77 |
| | | E'S | 12 | 12 | 29 | 49 | 35 | 36 | 21 |
| **CONTACTS** | | | | | | | | | |
| | TOTAL | ALL | 3863 | 15686 | 21536 | 30813 | 33851 | 33779 | 34911 |
| | NUMBER | E's | 1713 | 4418 | 8616 | 14538 | 16795 | 11326 | 7808 |
| | CONTACT | ALL | 4675 | 25149 | 33460 | 51898 | 60052 | 56630 | 56933 |
| | HOURS | E's | 1915 | 6878 | 13458 | 24916 | 31789 | 17765 | 11526 |
| | AVG. CONTACTS | ALL | 2.24 | 4.12 | 3.88 | 4.92 | 5.16 | 5.80 | 5.5 |
| | PER STUDENT | E's | 2.87 | 5.00 | 4.23 | 5.66 | 5.87 | 10.69 | 7.8 |
| | AVG. HOURS | ALL | 1.21 | 1.60 | 1.55 | 1.68 | 1.77 | 1.67 | 1.6 |
| | PER CONTACT | E's | 1.12 | 1.56 | 1.56 | 1.71 | 1.89 | 1.56 | 1.5 |
| | AVG. HOURS | ALL | 2.71 | 6.61 | 6.03 | 8.28 | 9.16 | 9.73 | 8.9 |
| | PER STUDENT | E's | 3.21 | 7.78 | 6.60 | 9.70 | 11.11 | 16.77 | 11.6 |

E's = students eligible under Federal Grant: Special Services for Disadvantaged Students
‡ Federal Guidelines Changed



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